



County of San Luis Obispo Standard for Data and Voice Cabling

Version 2.1
September, 2010

**Information Technology Infrastructure
General Services Agency - Information Technology**

TABLE OF CONTENTS

PURPOSE OF THE STANDARD	4
RESPONSIBILITIES	4
DETAILS OF CABLING STANDARD	4
General Standards.....	4
Horizontal Cabling	5
Telecommunication Closet (IDF/MDF).....	5
Telecommunications Cabling Rack Layout.....	7
Data & Voice Wall Outlets	10
Voice Backbone Cable and Termination.....	10
Fiber Optic Building Backbone Cable	10
Labeling and Identification	11
TESTING OF CABLING	12
Fiber Optic Cables	12
Data Horizontal Cabling System (Category 6a)	13
Voice Building Backbone Cables	13

1. PURPOSE OF THE STANDARD

The purpose of this document is to define standards for the structured communications cabling systems that enable the transmission of voice and data at County of San Luis Obispo facilities. The intent of this cabling standard is to provide a document to be used with all voice and data cabling projects, either new, upgrades, or maintenance, undertaken by the County of San Luis Obispo to ensure that the County is provided with a cabling solution that will maximize productivity and value by minimizing down time and maintenance requirements, while still providing for a future migration path to evolving technologies.

2. RESPONSIBILITIES

General Services Agency – Information Technology (GSA-IT) has the primary responsibility for the maintenance and management of all data and voice communication cabling at each County owned and leased facility. This responsibility includes:

- Management of the County's information cable plant
- Coordination of all cable installation, maintenance, and plant records
- Ensure compliance for new cable installations at County owned and leased facilities

3. DETAILS OF CABLING STANDARD

3.1. General Standards

3.1.1. All materials will be new.

3.1.2. All parts will be those listed or approved equivalents.

3.1.3. Materials and equipment shall be installed and tested as specified in the applicable publications, standards, rulings and determination of the following

3.1.3.1. ANSI - American national Standards Institute

- ANSI/TIA/EIA-568-B.1-10, B.2-10, B.3-10 - Commercial Building Telecommunications Cabling Standard
- ANSI/TIA/EIA-569-A - Commercial Building Standard for Telecommunications Pathways and Spaces
- ANSI/TIA/EIA-606-A - Administration Standards for the Telecommunications Infrastructure of Commercial Building
- ANSI/TIA/EIA-607 - Commercial Building Grounding and Bonding Requirements for Telecommunications

3.1.3.2. BICSI – Building Industry Consulting Services International

3.1.3.3. FCC – Federal Communications Commission

3.1.3.4. IEEE – Institute of Electrical and Electronic Engineers

3.1.3.5. NEMA – National Electrical Manufacturers Association

3.1.3.6. UL – Underwriters Laboratories.

3.1.4. All work shall be continuously coordinated with the County's General Services project coordinator, Maintenance staff, and or Information Technology staff.

3.2. Horizontal Cabling

- 3.2.1. The horizontal cable used for the distribution of data and voice shall be 4 pair, 24 AWG, Category 6a, plenum rated, LanMark 10-G2 Berk-Tek P/N 10130484 (Blue) or approved equivalent.
- 3.2.2. Where horizontal pathways are not noted as plenum space, riser rated (CM) cable may be utilized. LanMark 10-G2 Berk-Tek P/N 10137700 (Blue) or approved equivalent.
- 3.2.3. All cable runs must be 90m or less.
- 3.2.4. Horizontal cabling will be run in ceiling space.
- 3.2.5. Cabling must be appropriately supported along the entire path, using J-hooks, cable trays, or conduit and must not be attached to any other building wiring or conduit; and installed with sufficient bending radius so as not to kink, shear, or damage the cable.
- 3.2.6. Cable management straps shall be D-Ring style, velcro closure.
- 3.2.7. Horizontal Cabling Standard Parts
 - (OR-70700107) – Ortronics Velcro closure D-ring straps
 - (10130484) – Berk-Tek LanMark 10-G2 plenum rated cat. 6A cable
 - (10137700) – Berk-Tek LanMark 10-G2 riser rated cat. 6A cable

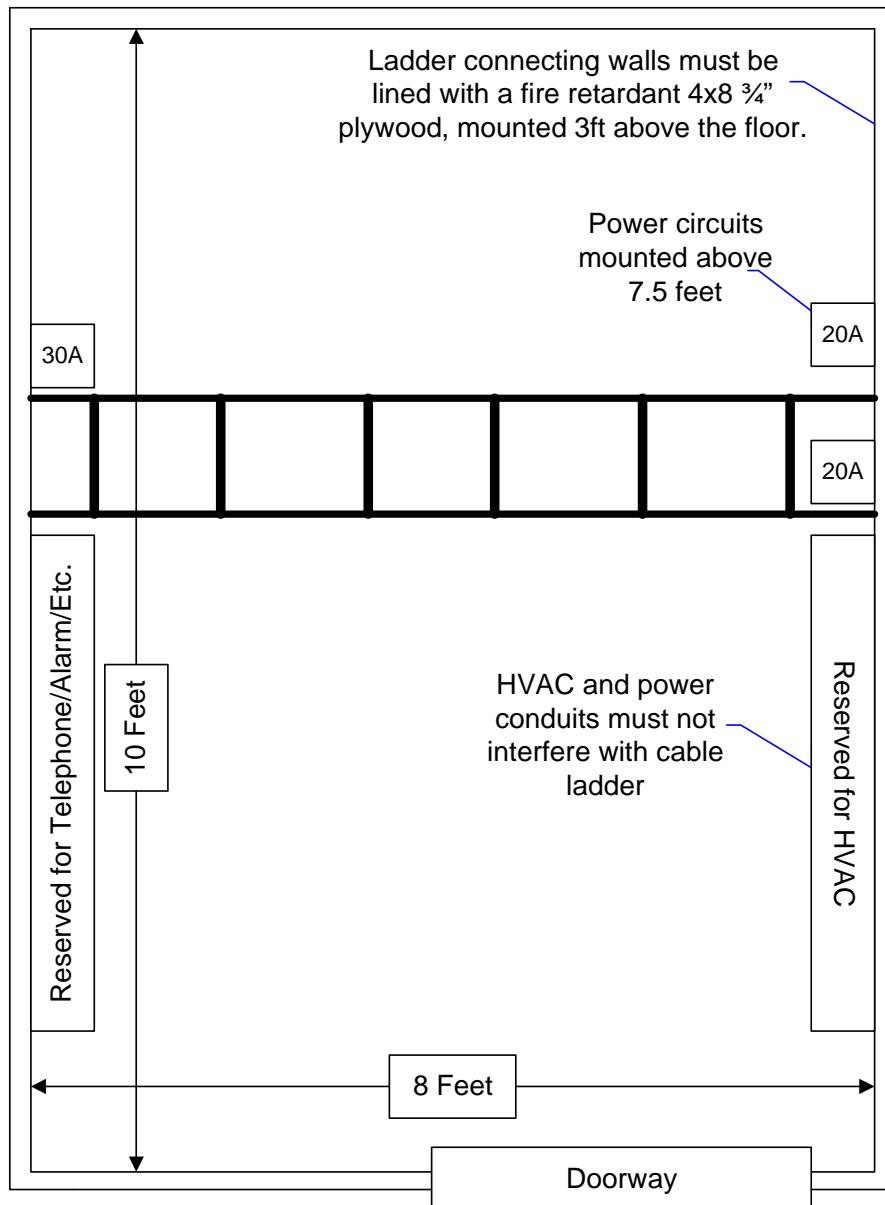
3.3. Telecommunication Closet (IDF/MDF)

The telecommunication closet, sometimes referred as the Intermediate Distribution Facility (IDF), aggregates data/voice cabling from wall outlets to a single location. Additionally, in larger buildings, multiple IDFs are connected to a Main Distribution Facility (MDF) using fiber optic cabling. For smaller, single floor buildings there may be only one telecommunications closet making it the MDF. Telecommunication closets are not designed to house or support server/computer equipment. A standard IDF/MDF is shown in Figure 1.

- 3.3.1. For new construction the IDF and/or MDF must be a minimum of 8' X 10' and 8' in height. For a building being remodeled the IDF/MDF should be 8' x 10' but existing building constraints may not make that possible, so GSA-IT will work with the appropriate staff to find an acceptable solution.
- 3.3.2. IDF walls must be covered with fire resistant ¾" plywood as appropriate to accommodate mounting of equipment, racks, ladders, power, etc. A minimum of two 4' x 8' backboards will be installed in each IDF.
- 3.3.3. Must have minimum two (2) 20A 120V, on opposite sides of the IDF, and one (1) 30A 120V electrical circuits.

- 3.3.4. Power circuits must be wall mounted 7.5 feet above the flooring.
- 3.3.5. Wall mounted power conduit and HVAC must not interfere with cable ladder wall mounting.
- 3.3.6. Racks must be anchored to the overhead cable ladder and the floor.

Figure 1: Standard SLO County IDF Design



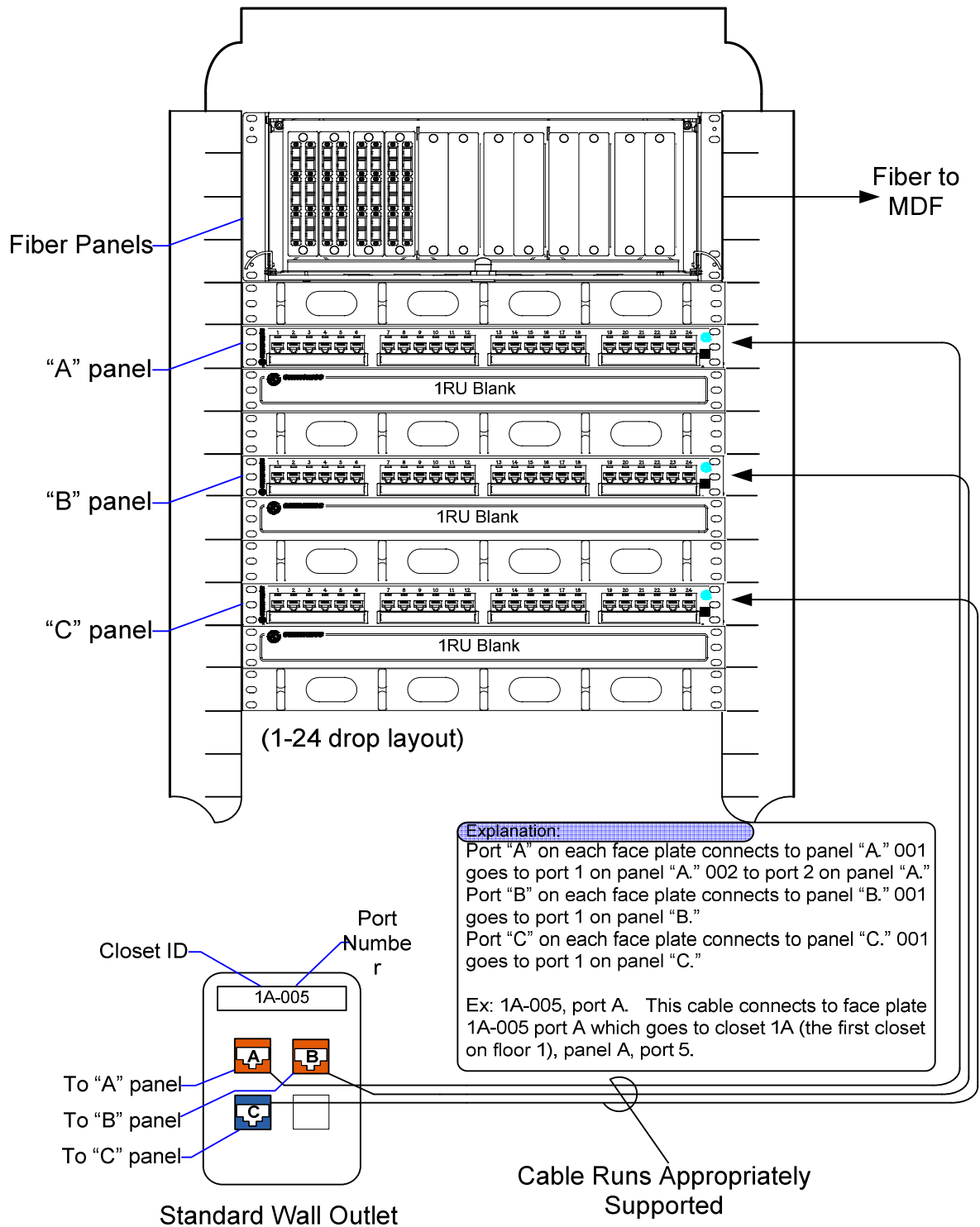
- 3.3.7. The overhead cable ladder will have a minimum of two points of attachment to the walls.
- 3.3.8. Wood or concrete flooring must be painted or covered.

- 3.3.9. Ceilings shall be “hard” with appropriate access hatches.
- 3.3.10. All racks shall be properly grounded, conforming to ANSI/TIA/EIA 607, NEC and all related grounding standards and codes.
- 3.3.11. All racks shall be installed side by side
- 3.3.12. Maximum of 288 copper cable terminations (96 drops for three cables each) per rack, additional cabling will require a second rack.
- 3.3.13. A suitable telecommunications ground for equipment as required per ANSI/TIA/EIA-607 (telecommunications grounding), IEEE Emerald Green book and NEC requirements will be provided in each IDF. All cable tray, ladders, equipment racks IDF/MDF shall be appropriately grounded/bonded to the telecommunications grounding.
- 3.3.14. IDF Standard Hardware. Parts other than those listed in this section shall not be used without prior County approval.
 - 3.3.14.1. Telecommunications Rack
 - (OR-MM6706) – Ortronics mighty mo cable management rack.
 - (OR-MM6CRB06) – Ortronics cable runway mounting bracket.
 - (40604-001) – Chatsworth concrete floor anchor kit
 - (40607-001) – Chatsworth wood floor anchor kit
 - 3.3.14.2. Cable Management
 - (OR-60400129) – Ortronics feed-through management panels
 - (OR-60400017) – Ortronics cable management rings
 - 3.3.14.3. Patch Panel
 - (OR-PHD610U24) – Ortronics clarity 24-port T568B.2-10.
Depending on the nature of the cabling, higher density patch panels may be used with prior approval.
 - 3.3.14.4. Blanks
 - (OR-401004788) – Ortronics 1RU blank filler panel
 - (OR-401004789) – Ortronics 2RU blank filler panel
 - (OR-401004791) – Ortronics 4RU blank filler panel
 - 3.3.14.5. Cable Runway
 - (10250-712) – Chatsworth black universal 12”
 - (11308-001) – Chatsworth runway j-bolt Kit
 - (11420-701) – Chatsworth runway wall mount
 - (11301-701) – Chatsworth runway splice kit
 - (10488-701) – Chatsworth runway junction kit

3.4. Telecommunications Cabling Rack Layout

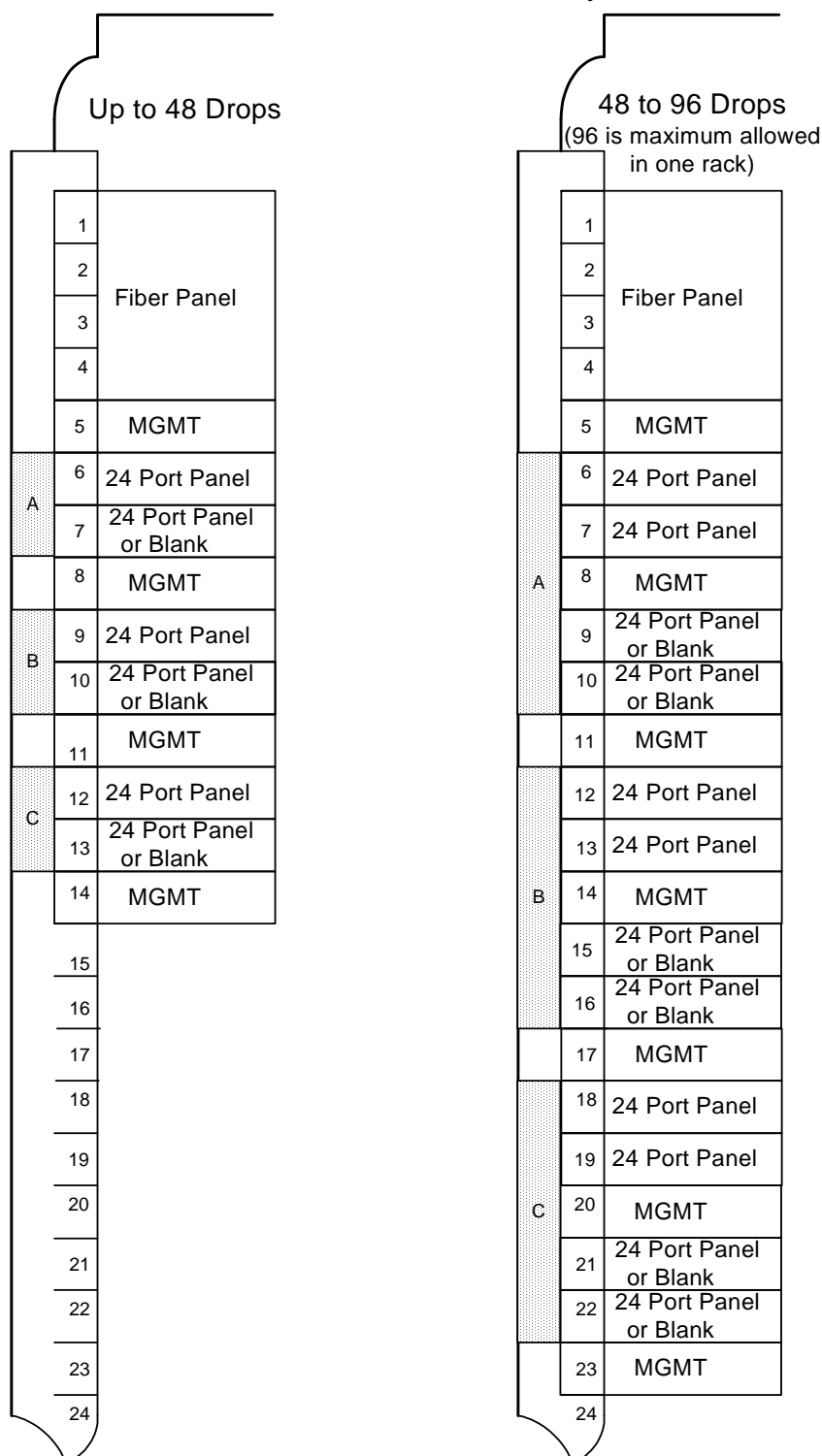
- 3.4.1. The typical telecommunications cabling rack layout is shown in Figure 2.

Figure 2: SLO County Cabling Rack Layout
A-B-C System Rack Standard



3.4.2. The number of three (3) cable drops along with the anticipated future expansion determines the cable rack layout as shown in Figure 3.

Figure 3: SLO County Cabling Rack Layout
for Different Number of 3 Cable Drops using
Standard A-B-C Rack Layout



3.5. Data & Voice Wall Outlets

- 3.5.1. Wall outlets shall be 4 port. A layout is shown in Figure 2 and Figure 4. Data ports #1 and #2 shall be orange and voice port #3 shall be blue. Port #4 shall be a blank.
- 3.5.2. Wall Outlet Parts
 - (OR-40300546) – Ortronics 4 port faceplate or (OR-40400055) Ortronics 4 port surface mount box.
 - (OR-TJ610-43) – Ortronics Orange modular insert
 - (OR-TJ610-36) – Ortronics Blue modular insert
 - (OR-42100002) – Ortronics modular blank (package of ten)

3.6. Voice Backbone Cable and Termination

- 3.6.1. All voice backbone cable between the Main Distribution Facility (MDF) and each Intermediate Distribution Facility (IDF) shall depend on the job specifications but in no case will be less than 50 pairs.
- 3.6.2. Terminate all voice cables on voice building backbone termination blocks mounted on the closet backboard reserved for telephone/alarms. See Figure 1.
- 3.6.3. All voice connections will be cross connected from the termination blocks to Category 5e patch cords. One end is punched down on the termination block and the other is plugged into section C patch panel.
- 3.6.4. Voice Cable and Termination Standards
 - (OR-MC5E15-09) – Ortronics modular patch cords
 - (10032112) – Berk-Tek 50 pair plenum voice backbone cable
 - (10032471) – Berk-Tek 50 pair riser voice backbone cable
 - (OR-110ABC5E050) - 110 voice termination block

3.7. Fiber Optic Building Backbone Cable

- 3.7.1. Fiber optic cabling used to connect IDFs with the MDF will be a hybrid of twelve (12) strands of multi-mode and twelve (12) strands of single-mode cable, black jacket, using Berk-Tek Adventum plenum rated cable or approved equivalent.
- 3.7.2. Where pathways are not noted as plenum space, riser rated cable may be utilized.
- 3.7.3. The multi-mode fiber must be 50/125 micron, riser rated, terminated with LC pigtails.

- 3.7.4. The single-mode fiber must be 8.3/125 micron OFNR terminated with SC pigtails.
- 3.7.5. All fiber optic building backbone cabling will be run inside using plenum rated 1 ¼" orange inner duct with a 900 lb pull tape. Couplings shall not be used to join shorter sections of inner duct in the middle of a run.
- 3.7.6. Fiber termination should be with pigtails that plug into adapter panels within the fiber patch cabinet. All pigtails will be fusion spliced. All splices shall utilize appropriate splice trays and shall use heat shrink sleeves or splice protection covers.
- 3.7.7. Fiber Optic Backbone Cable Standards
 - (custom order) – Berk-Tek hybrid plenum rated cable with 12 strands of MMF (50 micron) and 12 stands of SMF (SMF-28e)
 - (OR-FC02U-C) – Ortronics rack mount (2U) fiber patch and splice cabinets for up to 36 fibers. For use in the IDF.
 - (OR-FC04U-C) – Ortronics rack mount (4U) fiber patch and splice cabinets for up to 144 fibers. For use in the MDF.
 - (OR-OFP-LCD12LC) – Ortronics LC duplex (12-fibers) multimode adapters (aqua)
 - (OR-OFP-SCD12AC) – Ortronics SC duplex (12-fibers) single mode adapters (blue)
 - (OR-P3TF4ZRFZZZ002M) – Ortronics connector pigtail, 12 fiber, 50 micron MMF, 2 meters.
 - (OR-626TC4ZR-RZ002M) – Ortronics connector pigtail, 12 fiber, OFNR SMF, 2 meters.
 - (OR-FST2-F012) – Ortronics fusion splice tray for 12 fibers
 - (OR-20500043) – Ortronics heat shrink sleeves pkg 50

3.8. Labeling and Identification

- 3.8.1. All patch panel and wall outlet (station) designators shall be laser-printed black print on white background, no hand printing. The font shall be approximately 1/8 inches in height, block characters and clearly legible.
- 3.8.2. All labels shall be securely attached to faceplates and patch panels.
- 3.8.3. All copper and fiber optic cables shall be clearly labeled at both ends.
- 3.8.4. All patch panel and wall outlets will be labeled in sequential order as follows:
 - All IDFs and MDFs within a building shall follow a format of **fs**, where:
 - f = numeric character(s) identifying the building floor occupied by the IDF or MDF and s = alpha character(s) uniquely identifying the IDF/MDF on floor f,

Example: 1A is the first IDF on the first floor

Example: 3B is the second IDF on the third floor

All wall outlets (station) shall follow a format of **fs-n**, where:

fs = IDF/MDF designation described above; and n = three numeric characters designating the port on the patch panels on which each of the three cables are terminated in the IDF/MDF.

Example: 1A-011 is port 11 on patch panels A, B, C in the first (or A) IDF/MDF on the first floor

Example: 2C-124 is port 124 on patch panels A, B, C in the third (or C) IDF/MDF on the second floor

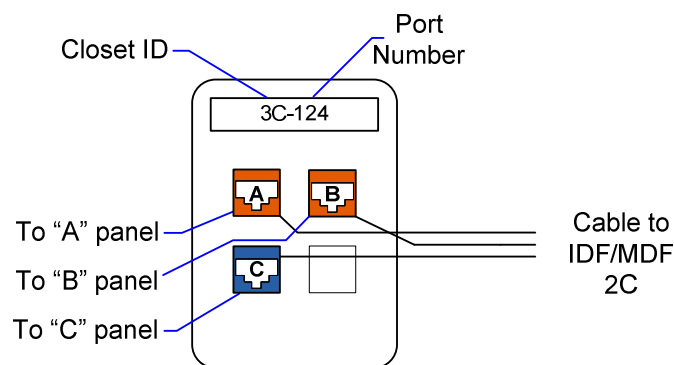


Figure 4: Standard Wall Outlet

3.8.5. Labeling Standard

- (OR-70700408) – Ortronics patch panel designator, white
- (OR-70700411) – Ortronics wall outlet designator, white

4. TESTING OF CABLING

- 4.1. All testing shall be performed after all telecommunication outlets have been secured in their final position and properly labeled. The building must be operational (i.e. building lighting and power must be energized during testing).
- 4.2. All original test results will be submitted in soft copy using the test equipment's native file format to the County's project coordinator – see 3.1.4
- 4.3. Submit one or more binders containing the following documentation and test results for all cables to the County of San Luis Obispo Information Technology Department. Binders shall be indexed with tabs denoting Main Distribution Facility (MDF) and Intermediate Distribution Facilities (IDF). All original test results shall have been uploaded directly from the cable test equipment and printed directly. Testing and documentation shall include, but not be limited to:

4.3.1. Fiber Optic Cables

- 4.3.1.1. Using an Optical Power Meter with memory and adapter measure and record end-to-end insertion loss for all installed cables, including: all connectors, cables and patch cords. All fiber optic insertion loss (attenuation). The total loss shall be measured and reported for each cable at the appropriate operating wave lengths, 850 nm, 1300 nm for multi-mode, and 1310 nm, 1550 nm for single mode fiber. Optical attenuation tests shall be conducted in both directions, end-to-end. The length of each fiber shall also be documented.
- 4.3.1.2. Using an Optical Time Domain Reflectometer (OTDR), all single mode and multi-mode cables shall be tested and record all fiber optic insertion loss (attenuation) and attenuation coefficient at the appropriate operating wave lengths, 850 nm, 1300 nm for multi-mode, and 1310 nm, 1550 nm for single model. The length of each fiber shall be documented and the distance to all splices and connections.
- 4.3.2. Data Horizontal Cabling System (Category 6a)
 - 4.3.2.1. All horizontal data (Category 6a) permanent link testing shall be performed using a Level IV accuracy cable tester, updated with the most recent firmware and using the correct link adapters. And record:
 - Length
 - Line map continuity
 - Pass or Fail on a Cat 6A connectivity test
 - 4.3.2.2. Tests shall be performed on finished cables (patch cords, patch panel, horizontal cable, station connectors) end to end.
- 4.3.3. Voice Building Backbone Cables
 - 4.3.3.1. Tests shall be performed on finished cables end to end and record:
 - Continuity
 - Shorts
 - Opens